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THE OMEN

not a wolf

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Policy

The Omen is a biweekly publication that is the world's only example of the consistent application of a straightforward policy: we publish all signed submissions from members of the Hampshire community that are not libelous. Send us your impassioned yet poorly-thought-out rants, self-insertion fan fiction, MS Paint comics, and whiny emo poetry: we'll publish it all, and we're happy to do it. The Omen is about giving you a voice, no matter how little you deserve it. Since its founding in December of 1992 by Stephanie Cole, the Omen has hardly ever missed an issue, making it Hampshire's longest-running publication.

Your Omen submission (you're submitting right now, right?) might not be edited, and we can't promise any spellchecking either, so any horrendous mistakes are your fault, not ours. We do promise not to insert comical spelling mistakes in submissions to make you look foolish. Your submission must include your real name: an open forum comes with a responsibility to take ownership of your views. (Note: Views expressed in the Omen do not necessarily reflect the views of the Omen editor, the Omen staff, or anyone, anywhere, living or dead.)

The Omen staff consists of whoever shows up for Omen layout, which usually takes place on alternate Friday nights in the basement of Merrill on a computer with an extremely inadequate monitor. You should come. We don't bite. You can find the Omen on other Fridays in Saga, the post office, or on the door of your mod.

Submit

Submissions are due always, constantly, so submit forever. You can submit in rich text or plain text format by CD, Flash Drive, singing telegram, carrier pigeon, paper airplane, Fed-Ex, Pony Express, or email. Get your submissions to omen@hampshire.edu or Ian McEwen, Box 286.

Views in the Omen (5)

Do not necessarily (7)

Reflect the staff's views (5)

The Omen Haiku

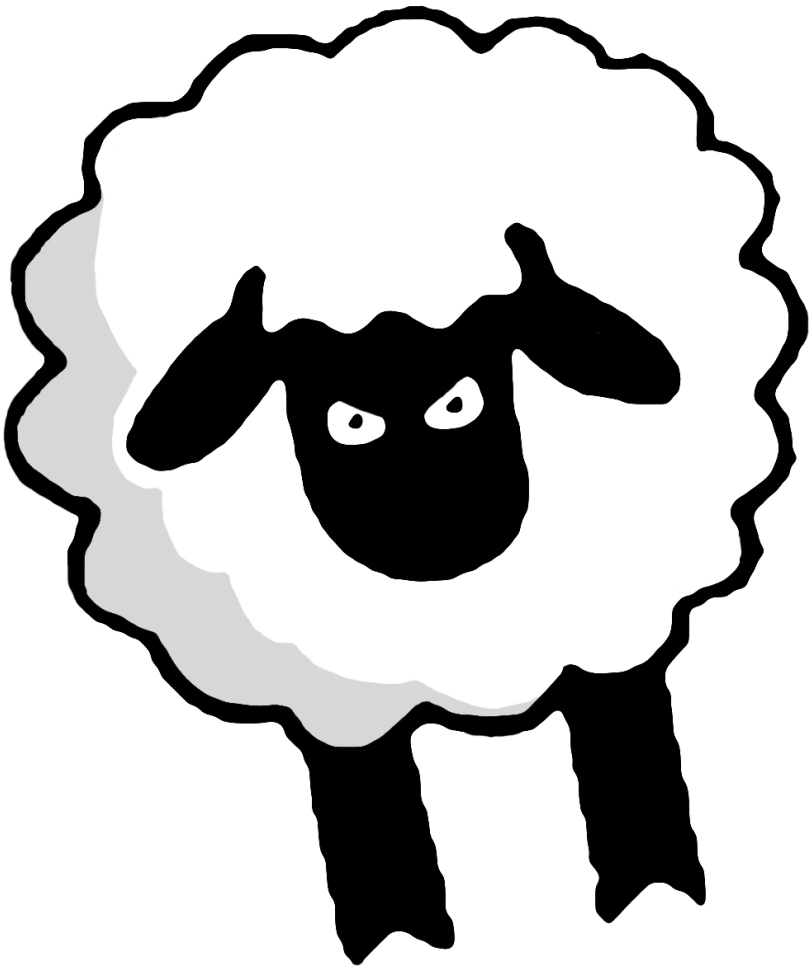
Layout & Editing Staff, plus assorted credits, along the bottom of pages

EDITORIAL

by Ian McEwen

So the title of this is just from the Lorem Ipsum that Adobe InDesign provides for you automatically. Which might be construed as lame, but I'm keeping it anyway. I like it. If you don't, sincerely suck the Omen sheep's gigantic Omen Dong.

That was a good start. Hm. Question now is what to write about. Section: Lies is empty, which I guess I should berate you all to correct, but it's a lot harder to be angry and hateful when it's not Section: Hate. I suppose I could write some short fiction on the topic? I'm really not sure here. Submit things to go in Section: Lies, that's the point. Also keep submitting things for Section: Hate, we still only had two. And, uh, don't construe this as any excuse to STOP submitting things for Section: Speak. Basically, keep submitting things. Maybe if you get your whole hall or mod to do it we'll name a section after your hall or mod in an issue. It's happened before, as all you regular readers (since really, who else reads these editorials) know.



There's also the new-ish layout. I got bored of the old one. This one might stay. The old one might come back. I might print the entirety of the next issue using the font Wingdings. Who knows. We're the Omen, we do what we want. Or what we feel like, entirely arbitrarily. For now: enjoy the Futura and Minion, or reminisce about the "good old days" of Gotham and Garamond. Basically, think about fonts. Really, all the cool kids are doing it. Actually, while you're at it, write something about fonts. Maybe something angry, or something fictional, but either way submit it afterwards.

The theme, as usual, has returned to SUBMIT. So do that? Thanks.

Onward. Further bullshit to talk about – got nearly half a page left to fill!

Oh, yeah. Connor: Next time, please send us your LaTeX source files. It'll be way easier. We might just do an issue in LaTeX, in fact. By which I mean, I may do an issue in LaTeX, unless I can rope Evan and/or Stephen into doing things for me (neither is likely). For the uninitiated, look up LaTeX on wikipedia. Be careful about the capitalization, or you'll learn about polymers (alternatively, read Connor's thing!); be careful about the pronunciation or you'll learn about the unstoppable anger of awkward nerds (like me!).

And now, one more paragraph-sized space to fill. Another Omen tradition: berating all you, dear readers, to come to Layout! It's at 8pm, alternate Thursdays (next one'll be the second week in November, a week after the date printed on the facing page), in the Omen Office (Publications Lab? We're not sure) in the Merrill A Basement.

Also: submit. We love you!

Ed quaspic tenisit aut lab im exceate mposamus

SECTION SPEAK

Untitled
by Dana Mendes

I admire the perfect congruence of
A bureau of mine, not federal nor
Possessed with foul investigation no,
A pleasant oaken cabinet that holds
What I fold and stymies no hand, but to
An opinion of health and fair labor
Recommends a free man, such as I will
Be again. Now ain't it fine, and ain't it great
To have a dresser and drawers without
A world fate? Yessir, Mr. Precedent.

Coca-Cola Cake

by Rachel Ithen

STEP ONE: Gather ingredients. Boxed cake mix and the equivalent of one can of soda (coca-cola for chocolate, sprite for vanilla).

STEP TWO: Pour cake mix into large microwavable bowl. Add in soda and mix the two together.

STEP THREE: Microwave for about seven minutes.

STEP FOUR: Enjoy easy cake-making goodness.

How should students be chosen to serve on decision-making bodies?

by Ananda Valenzuela

Here begins my perhaps-regular column on all things Hampshire, mostly involving power, process, and policy.

Over the past few weeks, I have been contacted by various members of the Hampshire community and asked for my advice regarding how best to craft a process for choosing students to serve on various committees. I'm interested in your thoughts on what works and what does not.

Below are the processes by which students were chosen for some current governance bodies. Which processes do you like? Which ones don't you like? What have been your experiences with these processes? What would you like to see in the future?

(Don't know what one of these committees does? Look them up on Hampedia!)

Community Council

Process: Community-wide elections after open nomination process in the Spring, for year-long positions beginning in the fall.

Some thoughts: Straightforward democracy, where students are elected representatives of their constituent bodies. However, this process has been plagued by extremely low participation rates, resulting in students assuming roles by default. In other cases, it has turned into a popularity contest. Is low participation a problem of the process, a problem of students not feeling that this body serves a meaningful purpose, a problem of advertising and awareness, or…?

Educational Policy Committee

Process: One slot open to each of the five Schools' student membership, and one at-large slot to which any student can apply. In the School of Criticial Social Inquiry, for example, the student members discuss who would like that slot, and in consultation with the Dean of the school, choose a student to serve on the body.

Some thoughts: Questions have been raised about how limited the selection pool of School members is, and how that makes the committee rather inaccessible to students who are not eligible for School membership. Since meetings are open, if a student cannot acquire a slot they are able to attend the meetings anyways. However, non-members cannot vote, participate in discussions, or serve on sub-committees. Despite the fact that it is one of the best ways to have real influence in Hampshire's academic system, students often have to be convinced to join this body because of the high workload.

Governance Task Force

Process: Student member appointed by the President, in consultation with the Deans.

Some thoughts: This is the least transparent process, since no information was distributed regarding the criteria by which students were judged, nor could students self-nominate or otherwise show interest in joining. That being said, if you trust the selected individuals to make equitable, well-informed decisions, this is a relatively efficient process and can be more in-depth than elections based on a paragraph-long interest statement.

Presidential Search Committee

Process: Student trustee was given one week to find at-large members. Open self-nominations, with statements reviewed by elected student representatives to the Trustee committees. Students chosen based on desired qualities outlined by the Trustees.

Some thoughts: This process was severely limited by time constraints, and a small number of students made the decision. However, if candidates can be relied upon to nominate themselves and if you trust the group of students making the decision, a body such as this one can serve as a search committee. They can take the time to really review each candidate in-depth, and reach a decision as a group.

Community Review Board

Process: Students are randomly chosen, and receive letter asking whether they would like to accept the membership. If a student turns it down, another student is randomly chosen and invited to join.

Some thoughts: This takes the human element out of the decision-making process and makes it completely equitable, as all students have an equal chance of getting chosen. Since students can turn down the nomination, only students who are willing to put in the time and effort actually serve on the committee. However, if a student specifically wanted to join this committee, there would be no way to join, other than hope that you were randomly chosen. This also does not take into account concerns regarding how a committee will function as a cohesive whole.

Committees of Community Council

Process: Any student can join at any time, provided that they attend three consecutive meetings.

Some thoughts: This is the process with the least barriers to entry, since there aren't a limited number of slots available, and no entity "screens" candidates and chooses whether or not they are allowed to join. This is more difficult for bodies that are only going to exist for a short period of time, or that deal with highly confidential material, as those bodies need a constant, dependable student presence and/or cannot have open meetings.

Personally, I think that different processes work better in different situations, and sometimes, part of the problem is transparency regarding how one becomes a member, not necessarily the process itself. But on the other hand, some processes create huge barriers to student participation, which leaves students who want to get involved feeling frustrated and disillusioned.

What do you think? I'm collecting your input and ideas to submit to the Governance Task Force and the President. Please write me at agv07@hampshire.edu.

Thanks for reading,
Ananda Valenzuela

Rainbow Cupcakes

by Rachel Ithen

STEP ONE: Mix cake mix according to box (or if you're not lazy like me… MAKE CAKE MIX FROM SCRATCH)

STEP TWO: Separate cake mix into five smaller bowls.

STEP THREE: Mix in separate gel food coloring into each bowl.

STEP FOUR: Pour different color mixes into cupcake pan. Layer the different colors.

STEP FIVE: Bake.

STEP SIX: Enjoy rainbow goodness.

On Machinery and Intelligence

by Charles Haigh

Humans often define themselves by their intelligence (or their rationality, or their thinking, which is in this sense of intelligence are all the same). This is reflected in our definitions of self; if you asked Descartes what a man was he would undoubtedly respond "A thinking thing", and if you asked a biologist they might say Homo sapiens sapiens, generally "thinking man" or "wise man". As such we often question the nature of thought and intelligence (though this is a general human trend as well- - to constantly question and categorize, one I would say reflects intelligence). Often, though, we think of this not only as a defining characteristic of humans but an exclusive one. We hold that the specific methods of critical thought, problem solving, communication, and other capacities for reason are held exclusively by humans and thereby we have the sole claim to "intelligence". However, is there any real justification behind this thought? Is there some unique aspect of physicality, of mind, of any other function, exclusive to humans? In this piece I intend to discuss and to largely dispel the notion that only humans are capable of true intelligence much in the spirit of Alan Turing, largely in support of his piece Computing Machines and Intelligence[1]. I intend to argue that machines will at some point be fully capable to entirely replicate the quality of humans thought of as "intelligence" and that there is no logical, fundamental reason why this could not be the case.

As with any text questioning the nature of things, it is incredibly important to define what it is we are discussing. In this context, that is intelligence. Part of the difficulty of stating whether non-humans could have intelligence is the fact that the definitions of intelligence are so widely varied, but I intend to tackle a number of different definitions and show that none of them prove challenging to my machines.

Machines have a very great ability to store information, most certainly far exceeding the capabilities of any human to do the same. They can also much more quickly store and reclaim any information that has been stored in their memories. However, this is not generally thought of as intelligence. It is argued that intelligence has to do with the ability to make use of information, not simply to store it. Of course, the machine is entirely able to do so. It does not just have the rules for arithmetic stored in it, it also has stored the exact methods to make use of arithmetic, so that if you were to ask it what 2+2 is it would promptly answer 4. This, I think, would satisfy no skeptics. This is just memorization, they would claim, something a book is entirely capable of, and thereby is of course nothing of intelligence.

It is complex thinking, and extrapolation of data, that qualifies for intelligence. The ability to make use of information in a way that is not inherent to the teaching of that information. If you teach a child 2+2=4, the clever child will be able to memorize it and when asked what 2+2 is will, just like the machine, promptly reply 4. This, however is not reflective of intelligence in the child. Take, instead the intelligent child. It has been taught 2+2=4 and has like the clever child memorized it, but as it is the intelligent child it has also understood it. That is to say that they child grasps that there are implications beyond the mere memorization of that form of this knowledge and that the same knowledge is applicable to many forms. Thus, if the intelligent child is shown one person with two apples and another person with two apples and asked how many apples there are, this child will quickly grasp the relationship between the two problems and, without counting apples, conclude

1 Turing, Alan, "Computing Machinery and Intelligence", Mind October 1950: P. 433–460

intelligently that there are four. This, we say is what the machine lacks. It can memorize and display, but it cannot understand.

This was an argument made by John Searle[2], that machines can do a complex series of analysis and displays but still possess no understanding. It seems to him that a complex set of associations is not enough to qualify for understanding, that the ability to extrapolate "hidden" information from something is not enough to say that one has understood it. He might argue that our smart child did not "understand" the notion of addition, that his brain was simply setup in such a manner as to produce that output from a given input. Take this story he uses for example:

"A man went into a restaurant and ordered a hamburger. When the hamburger arrived, it was burned to a crisp, and the man stormed out of the restaurant angrily without paying for the hamburger or paying a tip." Now, if you are given the question "Did the man eat the hamburger?," you will presumably answer "No, he did not." Similarly if you are given the following story: "A man went into a restaurant and ordered a hamburger; when the hamburger came, he was very pleased with it; and as he left the restaurant he left the waitress a large tip before paying his bill," and if you are asked the question "Did the man eat the hamburger?," you will presumably answer "Yes, he ate the hamburger."[3]

Searle rightly claims that a machine would be able to answer these questions as well as a human would, and it is my claim that this is displaying of intelligence. The machine, with it knowledge of things such as restaurants and eating and tipping will (like a human) make these conclusions. And that is intelligence, I will claim, to make such extrapolations. To take seemingly unrelated data as tips and restaurants and hamburgers and anger and figure out how all of this relates to the question, and the ability to do so is intelligence. Searle, however, will beg to differ. His claim is that the machine has only input-output and no understanding. This results in his famous Chinese room argument.

His claim made through this analogy of man-in-room using English instructions to manipulate Chinese symbols to respond correctly to given other Chinese symbols is that the machine, much like the man in the room, has no understanding of Chinese. That being while he can give the correct output from a given input (due to his English instruction manual, presumably an analogy to a machine's programming) he will understand neither and not a word of Chinese[4]. What, though, is meant by understanding? In my mind, and it seems also in Searle's, it is a question of intentionality, a question of "aboutness". What is it that this Chinese symbol is "about"? Well, in his room, through his instructions, Searle will understand quite well that symbol A is about symbol B (that is, that they hold a relationship to one another, which should be obvious when he responds to all symbol A's with symbol B). And to the computer it is the same, the question "Did he eat the hamburger?" is about the tip and the restaurant and the anger. I think Searle's claim to a lack of understanding, a lack of aboutness in the Chinese room, is one of complexity. In his room, he could never get association beyond one squiggle to another squiggle of seeming nonsense. Is there any more to human aboutness than that? I will claim there is not. When I say "box" your aboutness is nothing more than a cluster of associations (which carry their own aboutnesses): a certain shape, a certain color, a certain use, a certain material, etc. The machine is entirely capable of all of these things, it can certainly hold a complex set of interconnected aboutnesses, just as you can. Searle will call out "but that's just input and output, no understanding!" and if that is not aboutness, or understanding, then humans do neither themselves. Because the input of information or stimuli and the corresponding output of associations and behavior is all humans do either.

Thoughts, however, remain a barrier to intelligence for machines. We are aware of our internal monologues and thought processes and find it difficult to imagine a machine possessing a similar awareness. What, however, is a thought? This question relates intimately to the question of a human mind. What, though, is the nature of the human mind? This is a question still

2 Searle, John, "Minds, Brains, and Programs", Philosophy of Mind contemporary readings, edited by Timothy O'Connor and David Robb, P. 332-352

3 Searle, P. 333

4 Searle, P. 335

active in philosophical discussion, and as it is not the subject of this piece I will not address it. However, it is an entirely relevant one so I will discuss how either of the main theories of mind would pertain to my arguments (those being the dualist and the monist-physicalist).

The less popular, currently, of the two is the dualist position. That is that there exists both a physical body and a non-physical mind or soul or what have you that makeup a human, and perhaps it is so that both are required for intelligence? If it is a soul that you require, some ethereal being bound to a body, one must ask how it is so bound. The answer tends towards the otherworldly and powerful, that being (a) god (capital or lower-case g, as you like). If it is the case that we posses our souls bound to our bodies by god, then this is no barrier to machines and their intelligence. God may choose as god whims, to bind a soul to any machine of sufficient complexity to display intelligence. And perhaps all of the uncomplex ones already posses minds, unable to display it due to their physical restrictions. Really, though there seems no need for a mind. Our internal monologues and thoughts are commonly held to simply be the operation of the brain, an entirely physical being.

And if it is so that our brain is entirely physical, then it should pose no problem whatsoever in the formation of a machine-intelligence, no? Just silicon for carbon, electron for electron. Still, the physical view has challengers as well. There is some detail of the human that must be specific to intelligence that a machine could never posses. I will hold with Turing that this is a strange sort of prejudice towards machine, and a strange sort of mysticism of the human body (even stranger when not mysticism of the human spirit). Biology, however, might be a reasonable answer, though. Perhaps life is a necessity of intelligence, the ability to grow and evolve and change. Perhaps machines cannot become intelligent because they do not possess this. But that's not so, is it? Machines have very much the same capabilities to reproduce and change as do humans and the exact same mechanisms in many cases: human bodies themselves. Machines and programs are constantly reanalyzed and recreated to suit our needs. It is a strange sort of natural selection, I will grant: the one best at calculating Pi to 2000 digits survives, rather than the one best at gathering berries, but selection it still is. You might claim that this doesn't count (for whatever reason) that humans are still doing. Fine, have that. Still, there exist programs that are self-evolutionary. With a goal given to it, a machine will create thousands of programs that attempt to fulfill that goal. And it will test those programs at it, and after each test it will eliminate the programs worst at it, and recreate new programs by reassembling those best at it together, essentially mating them. This is the evolution and change inherent in life, and frightening as it might be for some, it exists in the machine. Biology, or perhaps a lack thereof, is no barrier to it.

There will always be a main issue of difficulty here, that being verification: even in another human, there is no real way (so far as we can tell) to know if they are conscious or thinking. We may be aware of our own internal thought processes, but those same processes in others are forever shielded from us. We assume the other humans, being that they are such similar creatures to us, must operate in a fundamentally similar manner, and we also observe that these other creatures behave in a manner similar to those we know who possess intelligence, so we, fairly logically, conclude that they too must possess intelligence. I propose to offer a similar test here. If it can be shown that computers may be structured to be fundamentally very similar to humans and that they do not lack any of the capabilities necessary for intelligence, as well as having the ability to behave in a manner that exactly reflects intelligence, I hold the only logical conclusion must be that computers and other non-human forms are entirely capable of intelligence. There is no fundamental requirement for intelligence that they lack, and they are capable of displaying behavior entirely in line with intelligence. Therefore, we must conclude that they posses it, especially if we hold any hope whatsoever of claiming that humans posses intelligence themselves.

Presidential Search Article

by Kristina Moss Gunnarsdottir, Ananda Valenzuela, and Sarah Gordon

After the announcement of Ralph Hexter's impending departure from Hampshire College, professor Marlene Freed agreed to become acting president of Hampshire until a permanent president was found. To facilitate the search for the next president, a committee of 16 members was formed who would work to locate prospective candidates that embodied the values of the college. The committee is comprised of representatives from the board of trustees, faculty, staff, and the student body. The 16 members serving on this committee were listed in the announcement as follows:

Gaye Hill, Committee Chair and trustee (independent not-for-profit consultant; past parent)

Shelley Johnson Carey 72F, elected alumni trustee (Director of Publications and Editorial Services and Editor of "Peer Review" for the Association of American Colleges and Universities)

Elizabeth Conlisk, faculty representative for the School of Natural Science (Associate Professor of Public Health)

Leslie Cox, staff representative (Farm Manager; past parent)

Ellen Donkin, faculty representative for the School of Interdisciplinary Arts (Professor of Theatre; school dean; current parent)

Yaniris Fernandez, elected staff trustee and staff representative (Associate Dean of Faculty)

Sarah Gordon 09F, student representative

Kristina Gunnarsdottir 08F, student representative

Rebecca Holland 77F, elected alumni trustee (Associate University Compliance Officer for New York University)

Sura Levine, elected faculty trustee and faculty representative for the School of Humanities, Arts, and Cultural Studies (Professor of Art History)

Josiah Litant 00F, staff representative (Assistant Dean of Students for New Student Programs)

Sarah Partan, faculty representative for the School of Cognitive Science (Associate Professor of Animal Behavior)

Robert Rakoff, faculty representative for the School of Critical Social Inquiry (Professor of Politics and Environmental Studies; school dean; past parent)

Sigmund Roos 73F, trustee and Board Chair (founding Partner of Block & Roos, LLP)

Kenneth Rosenthal, trustee (retired President of the Seeing Eye; Hampshire's first treasurer; past parent)

Ananda Valenzuela 07F, elected student trustee and student representative

The first task of the committee was to choose a national search firm to partner with. Once selected this firm will aid the committee in reaching out to a diverse and talented pool of potential presidential candidates. As the candidate pool is being created, detailed information about each candidate will be available for review by all members of the search committee. There will be multiple points of dialogue between the committee and the firm where feedback can be given as to how the committee feels regarding the candidate pool, if we need to outreach more, or whether the current pool is sufficient.

The search committee initially reviewed eight proposals from firms who expressed interest in working with Hampshire during the search process. The committee was very impressed by four of the proposals and invited those firms to visit campus for a more in-depth discussion of what working with them would look like. In order to find a search firm who would serve Hampshire best, the committee evaluated each firm based upon a range of predetermined criteria. The committee sought out descriptions of the search process from each of the firms We examined each firm's proposal for how they would asses a candidates 'fit' for Hampshire,

their commitment to the principals of shared governance and community involvement, and their knowledge of qualities that make Hampshire unique among liberal arts colleges. After these interviews, the committee unanimously decided that a partnership with Witt/Kieffer would best aid Hampshire in the search process. The committee was extremely impressed by Witt/Kieffer's ability to intimately discuss the Hampshire pedagogy, and their commitment to finding potential candidates committed to supporting Hampshire's continued development. Kate Will, the representative who we interviewed from Witt/Kieffer, will act as the principal in Hampshire's search. Her passion, knowledge, and enthusiasm, for working specifically with Hampshire College resonated throughout her presentation. The specificity with which she discussed how to find a candidate of the right 'fit' for Hampshire, made her presentation stand out against the 'cookie cutter' presentations given by some of the other search firms.

Involvement of the community over the next few weeks is crucial in creating a profile for what we as a community want from our next president. The student representatives will be holding regular discussions, where all students are invited to come and discuss what types of candidates they would like to see for the presidential position. The first meeting with the student representatives will be held in the Bridge Café on November 7th, and 2:30pm. In order for Witt/Kieffer to have the most thorough understanding of what Hampshire needs from it's next president, we must have input from all members of the campus. Please fill out the presidential search questionnaire at the link provided below. We will continue to post updates on the Student Daily Digest and are in the process of creating a Hampedia page that will serve to archive the evolving search process. Please contact us with any questions, comments, or concerns.

Presidential Survey: http://www.surveygizmo.com/s3/397597/Presidential-Search-Survey

Student Representatives:

Ananda Valenzuela (agv07@hampshire.edu)

Kristina Moss Gunnarsdottir (kmg08@hampshire.edu)

Sarah Gordon (smg09@hampshire.edu)

Wall of Omens #1: Darksteel Axe, a Girl's Best Friend

by Charles Haigh

Did I say girl's? I mean Lich's. I was used to putting my phylacteries on dinky machetes and expensive ass Swords of Rue and whatnot. But now I see this fucker. Phylactery Lich, despite being only somewhat powerful, is so damn exciting. And now what is he using as his symbol of eternal life and fuckingshitup? AN INDESTRUCTABLE AXE OF FUCKINGSHITUPTOO. Hell yes. And all of the artifact hate we'll be seeing now that Scars is rotating in makes both the sword and machete way less viable options for your Lich, and believe you me, we want him invincible. The only other options for real invincibility are Darksteel Myr (too much -X/-X in the set) and Darksteel Juggernaut (too expensive, terrible for the mono-black aggro we want our Lich in), so clearly this is how we'll do it. Now machete is the main contender with the spot here, same cost, both very aggressive, but since we're putting this axe on our Lich, the /+1 is totally irrelevant, and as I said with all the artifact hate swinging around now this is worth it. And how hilarious will it be when they finally find a target for their Shatter in your mono black and it's Indestructible. Hehe.

Limitation of Our Logic

by Zilong Wang

Here I want to explain why I think our logic is based on empirical observation, and therefore, our brain is not equipped to understand concepts that do not exist in this world, like "nothingness" or "infinity".

Humans are the result of a evolution in this very unique world. Our way of thinking comes with the physical environment around us. For example, "(P or Not P) is a tautology" is taken for granted because in our universe, black can not be white, and white can not be black. Our logical thinking is based on such crude observation.

But the Wave-Particle Duality challenges our fundamental assumption. A thing can be both wave and particle. So is "(P or Not P) is a tautology" still true? Or another example: scientist found that certain particles behave differently depending on whether or not there's people around. Another example: in our comprehension, there is always an end to a physical space, and beyond that end, there's something else bigger. Outside my house is the earth; outside the earth is galaxy. So what is outside the universe? Is there an end to our universe? If there is an end, then what is on the other side of that end?

These problems require us to rethink our fundamental assumptions. Our existing assumptions are made in a world of Newton physics. Our logic is then built on those assumptions. This logic is very powerful in dealing with questions in our layer of existence. But new scientific discoveries has revealed that when we go into other layers of existence (like quantum physics or astronomy), our old assumptions do not hold anymore.

This leads to my point: our logic belongs to our universe. With such logic, we can not imagine or understand things beyond our universe. We can not understand infinity or nothingness because they are not apart of our layer of existence.

"But", someone says, "of course we understand infinity. When I say the word 'infinity', you know what I am talking about, right?" Yes. I've heard the word "infinity". But that's far from understanding what infinity is. I tried hard, but there is no way that I can imagine infinity, or find a convincing explanation. Our definition of infinity is a compromise. We accept this compromise because it seems to be working pretty well in solving many problems, like in calculus. But this does not mean that we've really got it right.

I am fully aware that I am new to the field of logic and philosophy; I am not the first to ask certain questions; answers to my questions might have existed for thousands of years. I love to learn about my ignorance. Please let me know if there's a book that I should read, or some great minds that I should pay attention to. I'd love to hear your view points!

Topology Homework (Part 2)

Now in the two lines above substitute i's for j's and the the same result is reached thus:$|x_i - y_i| + |y_j - z_j| \geq |x_k - z_k| \forall i, j, k \in \{1, 2\}$ and $i = j$. Now if $i \neq j$:

$$d(x,y) + d(y,z) = |x_i - y_i| + |y_j - z_j| \tag{39}$$
$$i \neq j \Rightarrow i = k, \text{ or } j = k \tag{40}$$
$$\text{If } i = k,\ |x_i - y_i| + |y_j - z_j| \geq |x_i - y_i| + |y_i - z_i| \tag{41}$$
$$\geq |x_i - y_i + y_i - z_i| = d(x,z) \quad \text{by the triangle inequality} \tag{42}$$
$$\text{if } j = k\ |x_i - y_i| + |y_j - z_j| \geq |x_j - y_j| + |y_j - z_j| \tag{43}$$
$$\geq |x_j - y_j + y_j - z_j| = d(x,z) \quad \text{by the triangle inequality} \tag{44}$$
$$\tag{45}$$

Thus $d(x,y) + d(y,z) \geq d(x,z)\ \forall x, y, z \in \mathbb{R}^2$. For the drawing of the open balls at $(0,0)$ and $(2,3)$ in this metric, see the back.

B. for $x, y \in \mathbb{R}^2$ $d(x,y) = |x_1 - y_1| + |x_2 - y_2|$ The proof that this is a metric space will proceed in the usual way, by showing that the metric satisfies the axioms for a metric.

1. let $x = y,\ d(x,y) = |x_1 - x_1| + |x_2 - x_2| = 0 \forall x \in \mathbb{R}^2$ let $x \neq y$ $d(x,y) = |x_1 - y_1| + |x_2 - y_2|. \forall x \mathbb{R}, |x| > 0 \Rightarrow 0 < |x_1 - y_1| + |x_2 - y_2| = d(x,y) \forall x, y \in \mathbb{R}$ and $x \neq y$.

2.$d(x,y) = |x_1 - y_1| + |x_2 - y_2|$. $\forall x \in \mathbb{R},\ |x| = |-x| \Rightarrow |x_1 - y_1| + |x_2 - y_2| = d(y,x) \forall x, y \in \mathbb{R}^2$.

3.The Triangle Inequality

$$d(x,y) + d(y,z) = |x_1 - y_1| + |x_2 - y_2| + |y_1 - z_1| + |y_2 - z_2| \tag{46}$$
$$\geq |x_1 - y_1 + y_1 - z_1| + |x_2 - y_2 + y_2 - z_2| \quad \text{by using the triangle inequality twice} \tag{47}$$
$$\geq d(x,z) \forall x, y, z \in \mathbb{R}^2 \tag{48}$$

4 are the following topologies?

a. $\tau_1 = \{\emptyset, \{a\}, \{b\}, \{a,b\}, \{b,c\}, X\}$
No this is not a topology. the smallest topology that τ_1 is contained in is:
$\{\emptyset, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}, \{a,b,c\}, X\}$

b.$\tau_2 = \{\emptyset, \{a,b,c\}, \{a,b,e\}, \{a,b,c,e\}, X\}$
This is not a topology, the smallest topology that τ_2 is contained in is:
$\{\emptyset, \{a,b\}, \{a,b,c\}, \{a,b,e\}, \{a,b,c,e\}, X\}$

c. $\tau_3 = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c,d\}, \{a,b,c,d\}, X\}$
This is a Topology.

5 Problem 3 page 26 A First Course in Topology

Show T_f is a topology. for some $x_0 \in X$ the fort topology $T_f = \{U \subset X | X - U$ is finite, or $x_0 \notin U\}$. $\emptyset \in T_f$ because $x_0 \notin \emptyset$. $X \in T_f$ because $X - X = \emptyset$ which is finite. Thus the first condition for a topology is satisfied.

by Connor Gallagher

let $U_i \subset T_f$ for $i \in I$ where I is some index set. Now to show that the arbitrary union of sets is in T_f there are two cases to consider:
Case 1:

$$x_0 \notin U_i \ \forall i \in I \Rightarrow x_0 \notin \bigcup_{i \in I} U_i \tag{49}$$

$$\Rightarrow \bigcup_{i \in I} U_i \subset T_f \tag{50}$$

Case 2:

$$\exists \text{ at least one } j \in I \text{ S.T } x_0 \in U_j \Rightarrow X - U_j \text{ is finite} \tag{51}$$

$$\text{W.T.S: } X - \bigcup_{i \in I} U_i \text{ is finite} \tag{52}$$

$$X - \bigcup_{i \in I} U_i = \bigcap_{i \in I} X - U_i \text{ by De Morgan's Laws} \tag{53}$$

$$X - U_j \text{ is finite } \Rightarrow \bigcap_{i \in I} X - U_i \text{ is finite} \tag{54}$$

$$\Rightarrow X - \bigcup_{i \in I} U_i \text{ is finite} \tag{55}$$

$$\Rightarrow X - \bigcup_{i \in I} U_i \subset T_f \tag{56}$$

thus any arbitrary union of sets in T_f is also in T_f. Now for the third condition for a topology I will show that any finite intersection of sets in T_f is also in T_f. Again this is show with cases. For all three cases let I be a finite index set. Case 1

$$x_0 \notin U_i \forall i \in I \Rightarrow x_0 \notin \bigcap_{i \in I} u_i \tag{57}$$

$$\Rightarrow \bigcap_{i \in I} u_i \subset T_f \tag{58}$$

Case 2

$$\exists \text{ at least one } j \in I \text{ S.T } x_0 \in u_i \text{ but } \neg \forall i \in I x_0 \in U_i \text{ and} \tag{59}$$

$$\Rightarrow x_0 \notin \bigcap_{i \in I} u_i \tag{60}$$

$$\Rightarrow \bigcap_{i \in I} u_i \subset T_f \tag{61}$$

Case 3

$$\forall i \in I x_0 \in U_i \Rightarrow \forall i \in I,\ X - U_i \text{ is finite} \tag{62}$$
$$\Rightarrow X - \bigcap_{i \in I} u_i \tag{63}$$
$$\Rightarrow \bigcup_{i \in I} X - u_i \text{by De Morgan's Laws} \tag{64}$$
$$\Rightarrow \bigcup_{i \in I} X - u_i \text{ is finite. Because the finite union of finite sets is finite.} \tag{65}$$
$$\Rightarrow X - \bigcap_{i \in I} u_i \text{is finite} \tag{66}$$
$$\bigcap_{i \in I} u_i \subset T_f \tag{67}$$

Case 4

$$\exists i \in I \text{ S.T } u_i = \emptyset \tag{68}$$
$$\Rightarrow \bigcap_{i \in I} u_i = \emptyset \tag{69}$$
$$x_0 \notin \emptyset \Rightarrow x_0 \notin \bigcap_{i \in I} u_i \tag{70}$$
$$\bigcap_{i \in I} u_i \in T_f \tag{71}$$

If in cases 2, 3 if $\exists k \in I$ S.T $u_k = \emptyset$ the result is the same as in case 4. Therefore T_f is a topology.

6 Problem 4. Pg. 26 from A First Course in Topology

$$\text{Let } h \in X,\ \epsilon \in \mathbb{R},\ \epsilon > 0 \tag{72}$$
$$\text{W.T.S } F^{-1}(B(h(1), \epsilon)) \text{ is open} \tag{73}$$
$$F^{-1}(B(h(1), \epsilon)) = \{g \in X | g(1) \in B(h(1), \epsilon)\} \tag{74}$$
$$F^{-1}(B(h(1), \epsilon)) \subset B(h, \epsilon) \quad \text{by the def. of } B(h, \epsilon) \tag{75}$$
$$\text{W.T.S } B(h, \epsilon) \subset F^{-1}(B(h(1),)) \tag{76}$$
$$\text{Let } j \in B(h, \epsilon) \Rightarrow d(j, h) < \epsilon \tag{77}$$
$$\Rightarrow d(j(1), h(1)) < \epsilon \tag{78}$$
$$\Rightarrow j(1) \in B(h(1), \epsilon) \tag{79}$$
$$\Rightarrow F(j) \in B(h(1), \epsilon) \tag{80}$$
$$\Rightarrow j \in F^{-1}(B(h(1), \epsilon)) \tag{81}$$
$$\Rightarrow B(h, \epsilon) \subset F^{-1}(B(h(1), \epsilon)) \tag{82}$$
$$\Rightarrow B(h, \epsilon) = F^{-1}(B(h(1), \epsilon)) \quad \text{by (75)} \tag{83}$$

Because all open balls are open (as proved in class) this shows that F^{-1}(open) is open. Therefore F is continuous.

7 T_1 spaces

A) show that any metric space is a T_1 space.

Let (X, d) be a metric space. Now to show (X, d) is a T_1 space it is necessary to show that $X - \{x\}$ is open for any x. Let $y \in X,\ y \neq x$ and $d(y, x) = \epsilon$ by the axioms of a metric $\epsilon > 0$ and $\epsilon \in \mathbb{R}$. Then $x \notin B(y, \epsilon)\ \forall y \in X$ thus $X - \{x\}$ is open.

B) which of the three point topologies are T_1?

Only the discrete topology is T_1, because it is the only topology where the complement of any element of the topology is also in the topology.

A Review of Field Flow Fractionation and the Applications of Flow Field Flow Fractionation in Biological, Polymer, and Environmental Sciences

(next pages)

by Connor Gallagher

Abstract

Field flow fractionation (FFF) is a powerful family of analytical methods for the separation and identification of a wide variety of analyses. In general FFF uses a cross flow applied perpendicularly to a laminar carrier flow in which the analyte is carried. Depending on the type of cross flow, the analyte will be separated into different factions. Different types of cross flow determine the particular method of FFF. Discussed here are: thermal, electrostatic, sedimentary and flow FFF, with a more detailed discussion of flow FFF. Also current and past research involving FFF is discussed and used to contrast FFF to other separation methods.

0.1 Introduction

Field flow fractionation (FFF) is a family of analytical techniques used for size characterization and separation of macromolecules. In general FFF uses an exter- nal field applied perpendicularly to a sample flow to separate the analyte carried in the sample flow. This cross flow is selected so that it retards the analyte in such a way as to create a mass and or density gradient across the channel. Depending on the type of analyte different cross flows may be selected, for instance thermal, electrostatic, acoustic, aqueous, and centrifugal force fields have all been used for FFF [Messaud et al., 2009]. In this paper a brief description of various types of FFF are discussed as well as a discussion of their applications. Also we discuss in more detail those FFF methods using an aqueous liquid cross flow as employed in the Model F-1000-FO Universal Fractionator. This paper will also review current and past literature on the subject of FFF and its applications to environmental science, biology, and polymer sciences.

0.1.1 Thermal field flow fraction (ThFFF)

ThFFF is a method of FFF that uses a thermal gradient as the perpendicular cross flow. This method is most favorable for the fractionation of silicates and or latex polymer particles suspended in a carrier fluid. The carrier fluid is pumped through a narrow channel to which the thermal gradient is applied. Because of frictional forces along the edge of the channel the flow profile will become parabolic in nature with areas of higher flow rate towards the center this is called laminar flow. Towards the edge of the channel wall the flow rate becomes approximately zero. The thermal gradient across the particles causes them to obtain a lateral velocity by thermophoresis and accumulate on the edge of the channel wall. Particles of higher thermal conductivity, such as metallic particles, will have a lower lateral thermophortic velocity and therefore remain in areas of higher parabolic flow rate. whereas particles of lower thermal conductivity, such as silicates, will have higher thermophortic velocity and be moved to areas of lower flow rate. Thus particle are fractionated by their thermal conductivity [Shiundu et al., 2003]

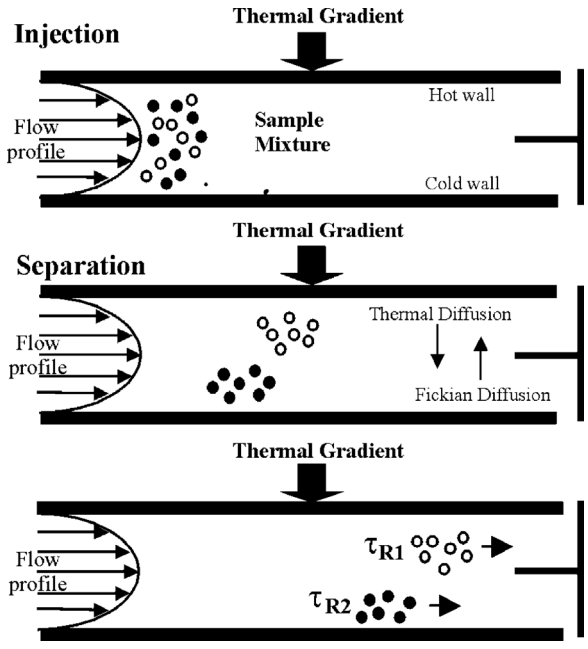


Figure 1: Thermal FFF setup picture from [Shiundu et al., 2003]

0.1.2 Electrical field flow fractionation (EFFF)

EFFF is similar to ThFFF in that a thin sample band is injected into a laminar flow which then enters a thin channel. In this channel the sample flow forms a par-

abolic profile with regions of higher low rate towards the center. In the channel the flow is then subjected to a non-uniform electric field perpendicular to the flow direction. By dielectrophoresis the particles are moved into different regions of the flow profile based on their electrical conductivity. In this way EFFF can be used to fractionate particles based upon their electrical properties.[Wang et al., 1998]

0.1.3 Sedimentation field flow fractionation

SdFFF is an interesting method of fractionation in that it uses centrifugal force to fractionate samples. In SFFF the sample band is injected into a laminar flow which then enters a thin ribbon like ring suspended in a centrifuge. The sample is then fractionated based upon mass because of the proportionality between force and mass more massive particles will be driven further to the exterior of the channel where flow rate is less and therefore particles in this region will exit the channel later. [Kirkland and Yau, 1982]

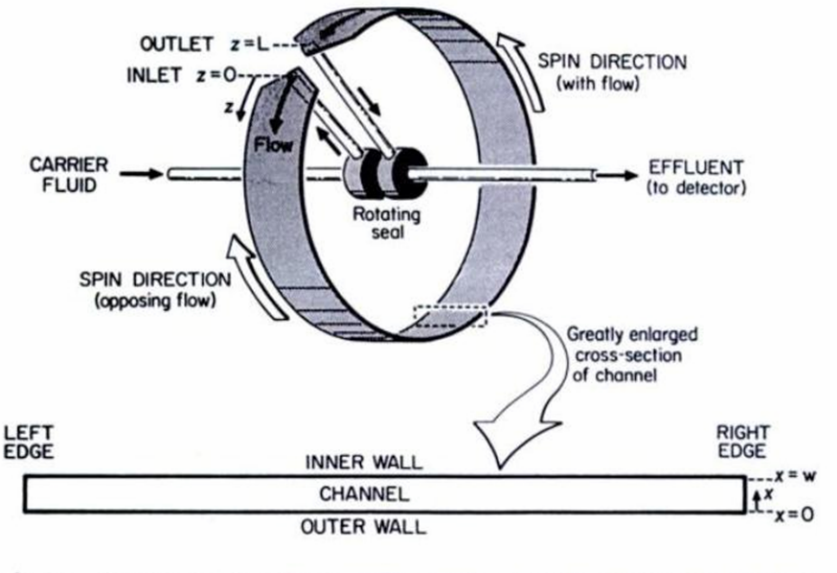


Figure 2: A Sedimentation FFF setup. picture from North Carolina State University Wiki:http://wikis.lib.ncsu.edu/index.php/Nanoparticles

A brief description of flow field flow fractionation FlFFF is withheld here as a more detailed discussion is given later in this paper. In the section following the discussion of FFFF, various applications of the different methods of FFF are discussed. In the final section this paper a description of the Model F-1000-FO Universal Fractionator is given.

0.2 Flow FFF (FlFFF)

Flow FFF is a method of fractionation first described by Gidding et al. in 1976 in their paper introducing FFFF as a method of size separation for macromolecules [Giddings et al., 1976]. FFFF is a method of FFF which uses an aqueous cross flow applied perpendicular to the carrier for fractionation. In a typical FFFF setup a high pressure liquid chromatography (HPLC) pump is used to pump the carrier into the channel where fractionation takes place. The channel is a long flat ribbon like chamber between two semipermeable membranes. A cross flow is pumped through the semipermeable into the channel so that it is perpendicular to the sample flow.

Membranes must be constructed such that the cross flow may pass through it but not the analyte. Materials that have been used as a membrane are: regen- erated cellulose, polyimide/poly(ethyleneterephthalate), sulfonated polystyrene, polypropylene, polyethersul-

fone, polyacrylamide, and polyacrylonitrile [Schimpf et al., 2000]. FFFF systems have two modes of operation which may be selected depending upon the size the particles to be fractionated. For small to medium sized molecules normal operation mode is required, for larger macromolecules the FFFF system should be set to run in steric or hyperlayer mode. In normal mode the carrier stream is pumped through the channel, where it forms a parabolic flow profile due to frictional forces at the channel's edge. During the injection phase a small band of analyte is injected into the carrier flow. As the sample band enters the channel the system enters the relaxation or stop-flow phase. During the relaxation phase the carrier flow is stopped but the cross flow remains on. When the sample flow is turned of the lateral force of the cross flow presses the analyte against the accumulation wall of the channel. Opposing the force of the cross flow is the back diffusion force of the molecules. These two opposite forces bring the system into a steady-state equilibrium with molecules of higher diffusion coefficients higher in the channel. Once the the sample flow is turned back on the molecules which are higher in the channel are eluted sooner. Therefore molecules are fractionated according to their diffusion coefficients [Amarasiriwardena et al., 2001].

In order to use FFFF systems for analytical purposes we must describe elution time mathematically. To do this first define the dimensionless zone thickness, λ, by λ = l/w where l is the mean layer thickness of the sample cloud at equilibrium and w is the total thickness of the channel. For FFFF λ can be expressed as:

$$\lambda = \frac{D}{Uw} \tag{1}$$

where D is the diffusion coefficient of the sample, and U is the velocity of one molecule of analyte through the carrier liquid. When the system is in the relax- ation phase the only velocity that any molecule of analyte may have is imparted to it by the cross flow, Vc/Aac where Vc is the flow rate of the cross flow and Ac is the surface area of the accumulation wall. Given that the area of the channel wall is equal to the volume of the channel (V0)

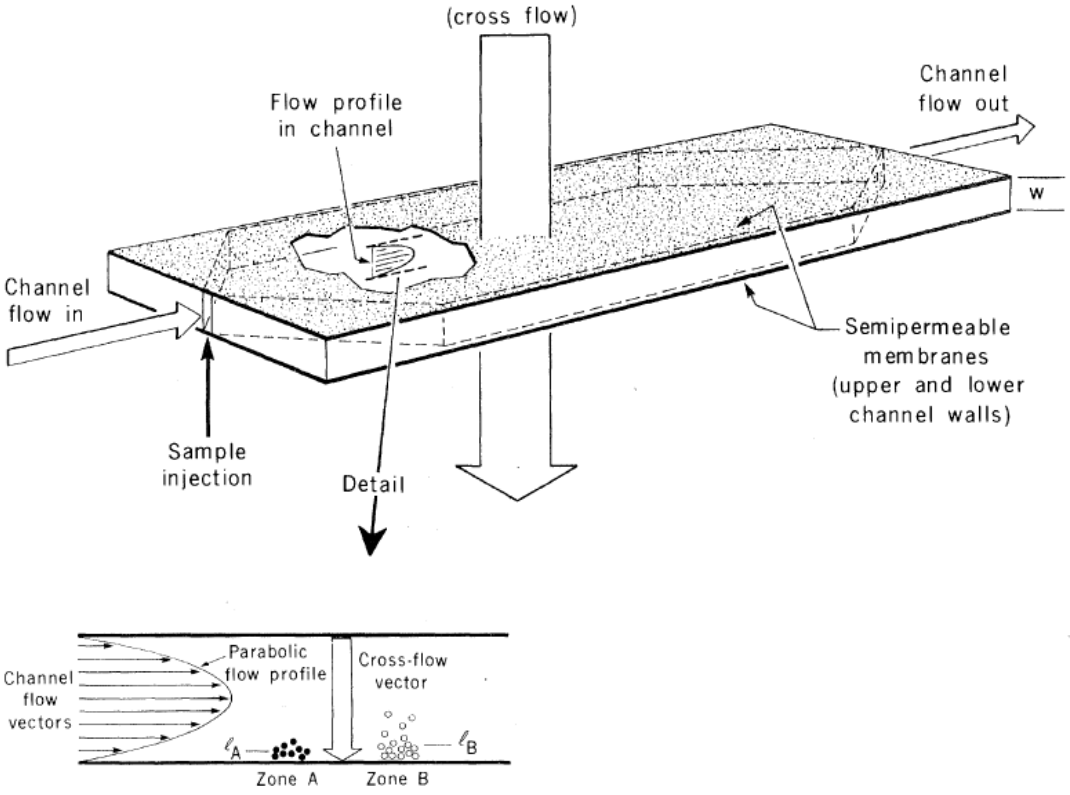


Figure 3: A graphic displaying a typical FFFF system. The detail shows the parabolic flow profile of the carrier flow. Picture from [Giddings et al., 1976]

divided by the thickness of the channel we get:

$$\lambda = \frac{DV_0}{V_c W^2} \tag{2}$$

we define the retention ratio of the system as:
where V 0 is the volume of the channel, Vr is the

$$R = \frac{V^0}{V_r} = \frac{t^0}{t_r} \tag{3}$$

retention volume of the channel, t0 is the void time of the channel, or the time it takes for the carrier fluid to flow through the channel without cross flow, and tr is the retention time of the analyte in the channel under cross flow. It has been observed that for small values of λ [Messaud et al., 2009]

$$R \approx 6\lambda \tag{4}$$

By (4) and 3 we get:

$$t_r = \frac{t^0}{6\lambda} = \frac{t_0 w^2 V_c}{6DV_0} = \frac{w^2 V_c}{6DV} \tag{5}$$

We now use the Stokes-Einstein equation which is as follows:

$$D = \frac{kT}{3\pi\eta d} \tag{6}$$

Where D is the diffusion coefficient of a substance in solution , T is the absolute temperature of the system, η is viscosity of the fluid, k is the Boltzmann constant, and d the hydronamic diameter of a molecule diffusing in the solution. We now use (6) and (5) to derive an expression for the diameter of a particle in a FFFF system as a function of retention time.

$$d = \frac{2kTV^0}{\pi\eta V_c w^3 t^0} t_r \tag{7}$$

By holding all of the parameters, other than retention time constant, this gives a method for determining the hydrodynamic diameter of particles in the analyte by their elution times. We can also derive an expression for the the molecular weight of particles as a function of retention time, we start with the following:

$$D = \frac{A'}{M^c} \tag{8}$$

where A' is a constant determined by the particular analyte and the carrier fluid, M is the molecular mass of the analyte and c is determined by the conformation of the molecule. Now by combining (8) and (5) we get:

$$M = \left(\frac{6VA't_r}{u^2 v_c}\right)^{1/c} \tag{9}$$

Again as with (7) we keep all the parameters constant other that tr and therefor we can determine the molecular mass from retention time. [Messaud et al., 2009], [Amarasiriwardena et al., 2001], [Schimpf et al., 2000] From this equation it can be seen that retention time of a particular substance is proportional to that par- ticles diameter. This equation however, fails to accurately describe the behavior of particles ≥ 1μm. If it is the case that the analyte contains large particles then the system must be set to steric or hyperlayer mode. If there are sufficiently large particles in the analyte then the system does not achieve the same steady-state equilibrium seen with small diameter particles. Because the particles are so large their diffusion will be negligible, as shown by the Stokes-Einstein equation and therefore they will be driven towards the accumulation wall with much greater velocity. Because of this greater lateral velocity and the particles large diameter the lift force acting in the opposite direction of the cross flow will be much greater and drive the particles into zones of much greater flow velocity. Then when the relaxation phase is over the large particles will remain higher in the channel and will therefore be eluted sooner. Therefor when attempting to fractionate a sample containing particles of diameter greater than 1μm it is necessary to set the system to steric mode so that the computer control mechanism may correct for the earlier elution times of large particles.

0.3 applications of FFF

As can be seen from the preceding discussion, there are many different types of FFF, and each different type has a many different applications in many different fields. Because of the staggering breadth of potential applications for every type of FFF, the discussion here on application will be limited to FlFFF and asymmetric FlFFF (AsFLFFF) [1]

[1] AsFlFFF, is an optimization of FlFFF wherein the separation channel has semi-permeable membrane on top. The the sample is injected into the channel with the cross flow and is "focused" by to oppositely directed laminar focusing flows. Then one of the opposite focusing flows is turned off and the sample eluates with the laminar carrier flow, fractionated according to diffusion coefficient.

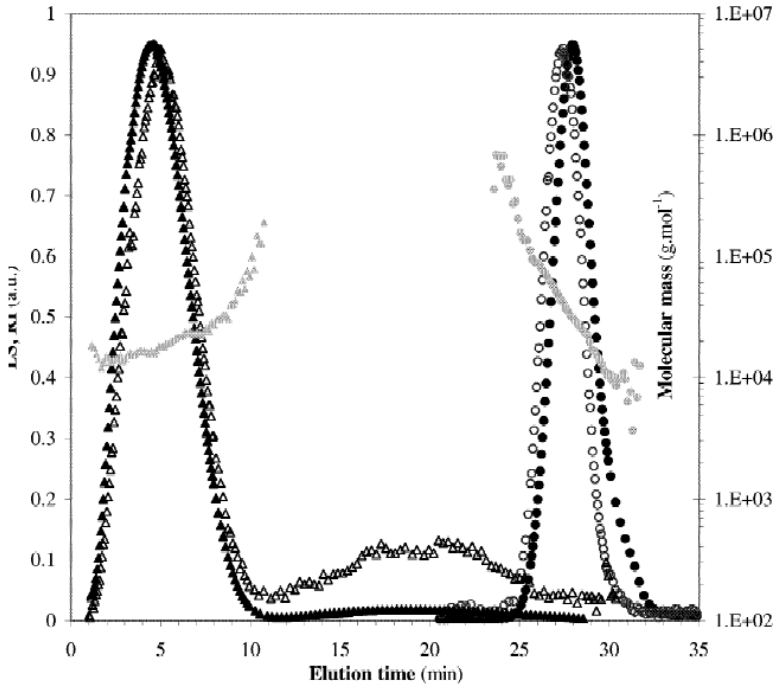


Figure 4: circle symbols show molecular mass as measured by the SEC/MALLS setup. Triangular symbols show molecular mass measured by the FlFFF/MALLS setup. Picture from [Duval et al., 2001]

0.3.1 Applications of AsFlFFF and FlFFF in Polymer Sciences

FlFFF offers in an attractive method of separation for analysis of polymers because it has the ability to resolve very fine particles with little to no risk of damaging the analyte by shearing or unintentional chemical reactions. Another Advantage of FlFFF is that field programming may be utilized to study not only the diameter and diffusion coefficients of polymers but also how those polymers react when specific chemicals are introduced to the carrier flow. For instance it was shown that core-shell polymers with a strene/butyl methyl acrylate cores and shells com- posed with ether carboxylated or hydroxlated acrylic acid shells undergo swelling as a function of pH and ionic strength of the carrier fluid. These core/shell poly- mers play an important role in the drying behaviors of various paint, gels, and laminates and their swelling behaviors help to predict the regularity and rate at which they dry in the environment. With the use of FlFFF it was shown that core/shell polymers with carboxylated shells undergo greater swelling than those hydroxlated shells and that this swelling was not determined by the core of the particle but rather the shell [Frankema et al., 2002]. FlFFF was used by [Frankema et al., 2002] because it eliminates the risk of contamination during a stationary phase, also because the possibility of physically harming the analyte is reduced as there is no solid component in the separation mechanism.

Another application of FlFFF in polymer sciences has been the the character- ization of pullulans. Pullulans are a hydrophobic polysaccharide which have been show to be an effective backbone for non-toxic biodegradable amphiphilic polymers [Kato et al., 1982]. Pullulans have been studied in an aqueous solution using size- exclusion chromatography with on-line coupling multi-angle laser light scattering (SEC/MALLS) but as [Duval et al., 2001] showed this method is inferior to FlFFF coupled to MALLS. In SEC the analyte is passed through a column packed with a semipermeable media through which particles eluate at different rates biased on their hydrodynamic volumes. In SEC however, the analyte is forced through the column because of the high density of the semipermeable media delicate particles are often damaged in the membrane. Also SEC columns have a very specific avail- able rage of size resolution and therefore only a small rage of analyte particle

sizes can be analyzed at any given time. In the case of separation of pullulans it was shown that FlFFF/MALLS produced separation and identification of pullulans

As 4 demonstrates the FlFFF/MALLS setup was able to measure molecular mass of the pullulans much sooner than the SEC/MALLS set up. A Similar study to [Duval et al., 2001] is [Picton et al., 2000] which showed that FlFFF/MALLS is not only much faster for the characterization of polysaccharide polymers but also it provides more accurate and complete results than SEC/MALLS. In the [Picton et al., 2000] study gum arabic was analyzed by both FlFF/MALLS and SEC/MALLS to determine the chemical structure of gum arabic. In this study FlFFF/MALLS was able to accurately analyze a larger number of size fractions than SEC/MALLS, furthermore it was ale to do so much faster. These results in conjunction suggests that FlFFF can be used as an alternative to SEC in some cases as a tool for characterization polymers. Furthermore FlFFF can be used to successfully analyze polymers which are vulnerable to conformational changes caused by physical interactions present in SEC.

0.3.2 Biological Applications of FlFFF

Because of its ability to fractionate very fine to very large particles through a inert separation processes FlFFF, provides an excellent potential for applications in the biological sector. In biology the conformation of a macromolecule plays a very important role in determining chemical reactions within the organism. Therefor a separation method which does not jeopardize the conformation of the analyte plays an important role in biological analysis. One area of biological research which shows great potential for the application of FlFFF and AFlFFF is the separation and characterization of proteins from samples. Particular proteins of interest are lipoproteins and how they affect the health of hu-

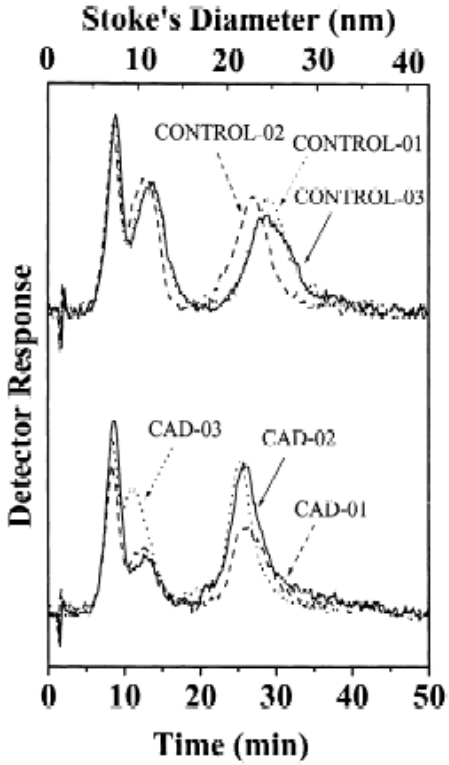


Figure 5: the upper graph show HDL and LDL levels in a healthy patient. The lower graph shows HDL and LDL level in a patient with CAD. The peak at lower Stokes' diameter indicates HDL counts. The peak at higher Stokes' diameter indicates LDL levels. Picture from [Park et al., 2002]

mans. Lipoproteins are macro- molecules made up of lipids and proteins and serve as a transport mechanism for lipids throughout the vascular system. A lipoprotein has a core made up of hy- drophobic mulcules such as neutral lipids, cholesteryl esters, and triglycerides the shell of of the molecule is made up of phospholipids, free cholesterol and apopro- teins. Lipoproteines are classified into three categories, high density (HDL), low density (LDL), and very low density (VLDL). LDL are often a subject of interest as a positive correlation between them and coronary artery decease (CAD) has been established [Rajman et al., 1996]. An important application of AFlFFF has been in the investigation of the role played by HDL in relation to the health of CAD patients. A 2002 study by Park et al. [Park et al., 2002] investigated HDL levels in healthy patients and patients with CAD. The picture bellow shows HDL and LDL levels in a healthy person and a person with CAD.

FlFFF was used because the human plasma samples could be injected directly into the instrument without the need for any pre-processing. In this study it was discovered that not only is there a positive correlation between LDL and CAD but a negative one between HDL and CAD. This is clearly a significant result as it establishes a new link in development of CAD which had previously been unknown.

Another question for in biological research has been how to successfully ex- tract entire cells from a sample, with out damaging them and as shown by / cite- Hookeun2003 this is possible with FlFFF. In [Lee et al., 2003] E. Coli and P. putida cells were separated and analyzed by FlFFF coupled to matrix-assisted laser desorption/ionization time-of-flight mass spectroscopy (FlFFF/MALDI-TOF-MS). In this study FlFFF was used because it allowed for the separation of entire bac- terial cells fractionated according to their developmental stage. FlFFF was ad- vantageous over other separation methods such as a centrifugal separation technique because it was not only faster but much gentler on the the sample and allowed for the sample bacteria

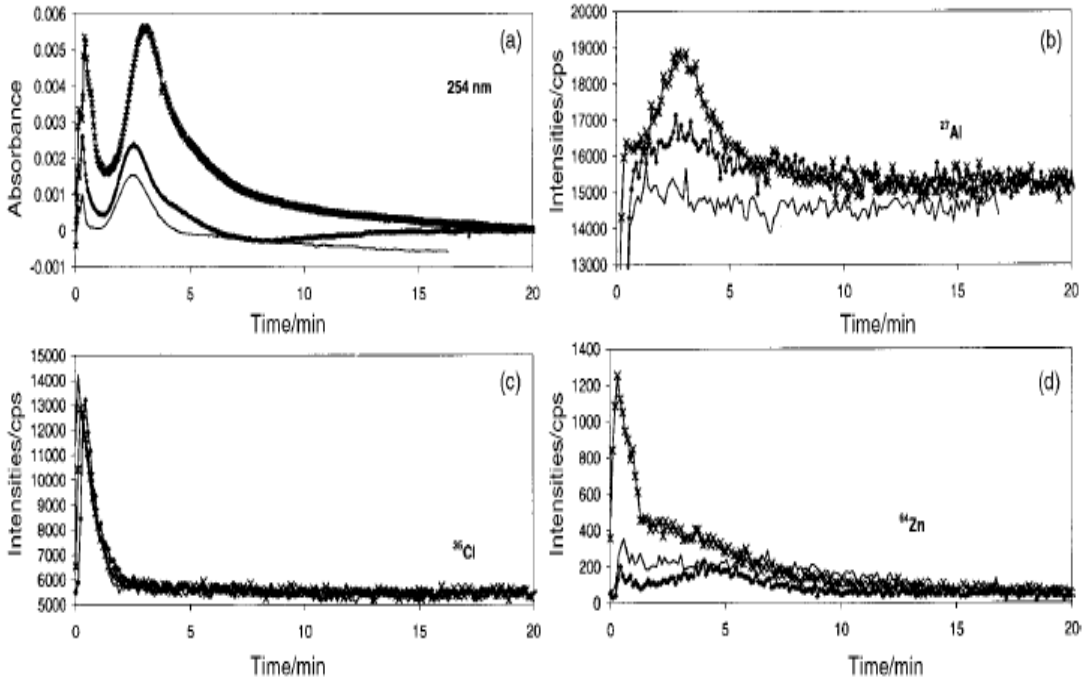


Figure 6: (a) shows influent water relative to effluent water after primary and secondary treatment. (b) shows $^{2}7$Al concentrations. (c) shows $^{3}5$Cl, and (d) shows $^{6}4$ Zn. In all the diagrams an x represents influent water, a bold line shows water after primary treatment and a thin line shows after secondary treatment. Picture from [Amarasiriwardena et al., 2001]

to be fractionated in an aqueous solution under similar conditions as their native environment. This ability for environmental control allowed for dynamic analysis of bacterial growth which can hopefuly shed light on future bacterial research [Lee et al., 2003]. The same principals have also been applied to extracting extracting ribosomes and tRNA from the interior of E. Coli cells. In the study by [Arfvidsson and Wahlund, 2003]the application of AsFlFFF was examined as a more efficient alternative to centrifugal separation. It was shown that AsFlFFF was not only much faster that than centrifugal sepa- ration but it required no preprocessing and that it was on the whole more reliable [Arfvidsson and Wahlund, 2003]. The results of [Arfvidsson and Wahlund, 2003] can be examined along side of those by [Lee et al., 2003] to show that FlFFFcan be applied as an effective separation method for whole cell fractions as wells as sub-cellular sized analytes. Also the gentleness and lack of potential analyte shearing during a stationary phase shows that FlFFF can can be applied with very successfully in biological studies as both a replacement for other separation methods and as an additional tool for fractionation of biological analytes.

0.3.3 Environmental Applications of FlFFF

Humaic acids (HA) are of particular for in environmental sciences as they act as a important mechanism for heavy metal and organic transport within the environment. HA are globular macromolecules which can be found in rivers, streams, and lakes as well as soil. HA are a vital link in the transport cycle of metals as they tend to bind to the surface of HA which they transport them throughout the environment. Because of this capacity for HA to capture heavy metals on their surface it is necessary to determine the molecular weight of specific HA in oder to identify the metals on their surface. In the past molecular mass of HA has been determined by low-angle X-ray scattering but this method is not suited for on- line coupling to sophisticated sample identification methods such as inductively coupled plasma mass spectroscopy (ICP-MS). By employing FlFFF however it is possible to fractionate HA samples and identify trace metals bound to them through ICP-MS. This method was applied to the study of municipal waste water derived HA by [Amarasiriwardena et al., 2001]. In this study influent waste water was compared to and effluent wastewater after primary and secondary treatment.

Figure 6 demonstrates the potential for FlFFF to successfully identify metal concentrations bound to humic fractions. As would be expected figrue 6 also shows a marked drop in trace metal concentrations in waster water after treatment.

Another growing concern in environmental sciences is the possible effects of nanoparticle contamination. In recent years nanoparticles have become a rapidly growing field of study and possible applications span from computing to chemical engineering. Of particular interest in nanoparticle research are fullerene nanopar- ticles such as nanotubes, or spherical carbon structures called Bucky Balls (C60). These carbon nanoparticles are of such interest because they can effectively be synthesized into any shape based upon desired physical and electrical properties. There is a wealth of knowledge on the the physical properties of carbon nanos- tructures but there is still very little research on both the ecological and biolog- ical impacts of them even as they enter large scale production. Because of this lack of knowledge it is very important that the risks involved with nanoparticles be fully researched. One step towards describing the environmental impacts of nanoparticles was the study done by [Isaacson and Bouchard, 2010]. In this study C60 particles were separated through AsFlFFF in order to determine typical C60 fractions in aqueous environments. One problem typically encountered when an- alyzing C60 is the tendency for the analyte to clump together and form massive groups of particles. This difficulty is averted however, when using FlFFF as the the ionic concentration and pH of the sample flow may be controlled so as to pre- vent analyte clumping, also because FlFFF is relatively gentle there is no danger of shearing the delicate C60 particles. In their study [Isaacson and Bouchard, 2010] demonstrated that the use of AsFlFFF is very advantageous and produces very nicely defined C60 fractions, bellow is a picture taken from a transmission electron microscope (TEM) showing these fractions:

As can be seen from figure 7 fractionation of C60 particles produces well defined groupings of particles

fractionated by size. This clearly shows that AsFlFFF is a viable method for the separation and characterization of C60 particles. This result coupled with that of [Slaveykova and Startchev, 2009] who used FlFFF to separate quantum dots suggest that FlFFF can be used as a versatile separation method for all families of nanoparticles. The study by [Slaveykova and Startchev, 2009] is significant because it demonstrated the fractionation of quantum dots which are carbon nanoparticles of size < 10 nm in diameter, which shows the specificity of resolution of FlFFF.

0.4 conclusion

FFF methods for separation are indeed a powerful tool for analytical studies which hold an advantage over many other separation techniques in the sheer breadth of their applications. Furthermore the underlying theoretical principals behind FFF are relatively easy to understand and model and therefore implement and optimize. FFF is advantageous to other separation methods because not only does it provide a versatile platform for analysis but it can be easily coupled to other analytical de- vices. Another strength of FFF is its inherent inertness which allows for analytes of diverse size fractions to be analyzed without danger of shearing or contamination. An example of this being the study done by [Lee et al., 2003] in which entire bac- terial cells were extracted and fractionated according to how fully developed they were. Also because of the simplicity of FFF it is possible to craft experimental con- ditions that mimic those found in more complex "real word" environments. An example of this being the study by [Frankema et al., 2002] wherein carrier flow ionic concentrations and pH was manipulated to simulate drying conditions of core/shell polymers. One of the most striking demonstration of the power of FFF is the applications of FlFFF to environmental sciences, as has been shown here FlFFF has the ability to fractionate molecules of sizes from the macro scale to the nanoscale [Amarasiriwardena et al., 2001] [Slaveykova and Startchev, 2009]. FFF lacks however, the shear maturity of other methods of liquid chromatography and because of this this there is a dis-

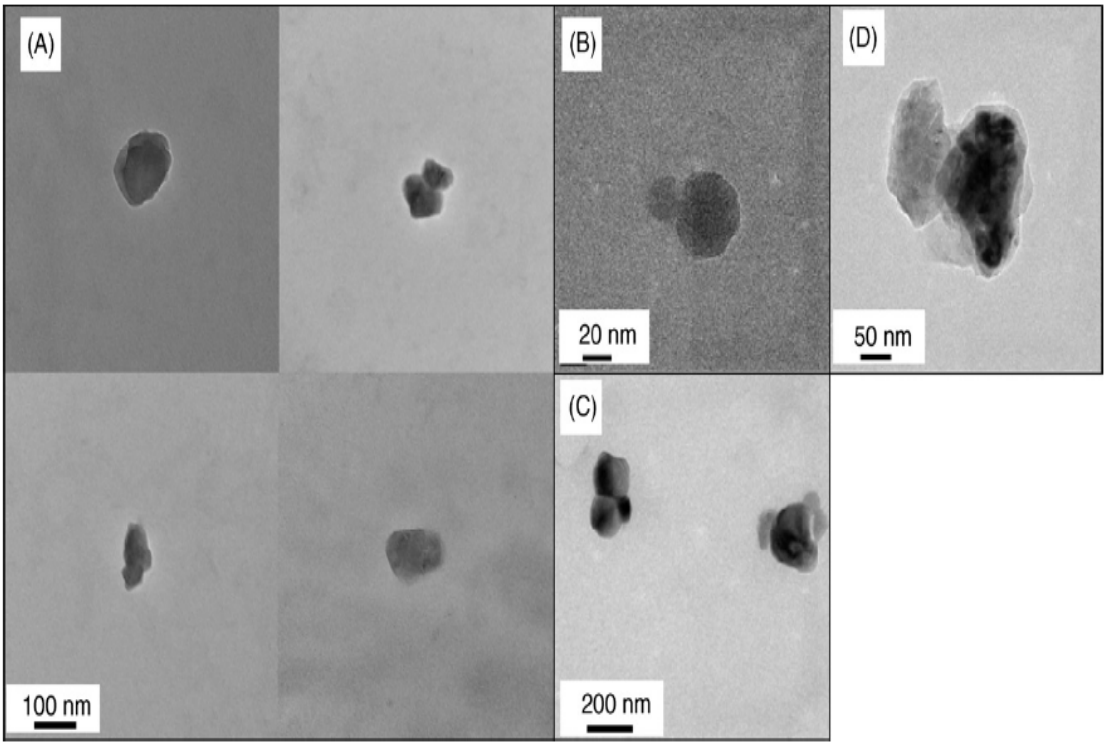


Figure 7: TEM images of fractionated C_60 particles. (A) shows particle size from 80-100 nm, (B) shows particles of sizes 150-200 nm (C) and (D) shows particles of size 200-260 nm. Picture from [Isaacson and Bouchard, 2010]

parity in the amount of research applying it and studies using methods like SEC. Because of this there is a lack of research on optimizing and improving FFF methods. This task of optimizing FFF is a very fruitful avenue for future research which will hopefully be explored by studies to come.

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SECTION

HATE

Open Letter to the Grabby Hampshire Kid at the Hold Steady Show in Pawtucket

by Evan Silberman

Dear grabby kid,

I'm pretty sure you're from Hampshire, since you came to the show with some people who I am pretty sure go to Hampshire, so there's at least an off-chance that you're reading this. And as such I'm not going to fill this letter with hurtful and inflammatory nonsense, since that would be rude. Anyway, it's clear that at the show on Sunday you and your crew were really happy and excited to be there, which is awesome; seeing the Hold Steady live is incredibly fun and I'm glad you got to go. And obviously once they started playing personal space near the front of the stage kind of went out the window, which is what happens at Steady shows. We were all pretty much expecting that.

Just because you're near the front at a high-energy rock show, though, doesn't mean that you have unlimited license to do what you want to your neighbors' bodies, though. Specifically, it should've become clear to you very quickly that people were not OK with you grabbing their heads. Early on in the set you were grabbing the head of a bearded, flannel-and-hipster-glasses-wearing young man in front of your group, and despite his decidedly negative reaction to this, you insisted on trying again a couple of times to grab his head. You seemed very put out and surprised every time he threw you off of him.

Later on, you were grabbing the head of a young woman who was near me, and she even used the word "no" with you, which, as you should know by this time in your life, fucking means "no". Me and her presumptive boyfriend ended up having to devote about half of our attention to boxing you out and keeping you from grabbing her head, when that attention should have been devoted to singing along with Craig Finn and participating in less aggressive forms of rock concert physical intimacy.

So dude, exuberance is fine, awesome, and totally what being at a Steady show is about. But if you're being so exuberant that you are grabbing the heads of people who do not want their heads grabbed, you need to figure out why your judgment and self-control were apparently so compromised that you were unable to restrain yourself after it was made clear to you that the head-grabbings were not appreciated.

Keep it posi, is what I'm saying.

Sincerely,
Evan S.

I HATE BLACK PEOPLE...!!!!!!111

by Lauren Fraser

And before I have a mob consisting of the 10 or so black people on this campus (or the always-angry white people going on about "white-privilege" and whatever-the-fuck who probably think I'm a neo-Nazi or some other minority-oppressing individual) show up at my door with torches and a rope, let me clear this up now. I'm black. I've been asked if I was Indian, and my sister was once asked if she was Hispanic, but let me assure everyone right the fuck now…I AM BLACK.

Now, I'm sure we all have those moments where we read or hear or are unfortunate to stumble upon something that a) makes us want to bang our heads repeatedly against a wall while screaming 'WHY, GOD? WHY?' and b) fills us with so much rage that you just hope that maybe the apocalypse will come early and destroy the world in a giant ball of flame so you don't have to put up with this shit anymore. Don't lie to yourselves. You have those moments…it isn't just me. Maybe I'm more vocal about it. And by vocal, I mean I retreat into my music or take out my aggressions on the splicers in Bioshock (You cannot escape my wrench! Don't even try!) and laugh maniacally while setting them on fire. I had my moment a couple weeks ago.

I blame Pia.

Although, the blame cannot be solely placed upon Pia, because I could have just turned around and left. But no. Such things are like train wrecks. They're gruesome, but you can't help but move closer to get a better look at just how that conductor's head did a complete 180. See, Pia found a website of "ghetto" baby names. Because just looking at a lot of black people in the world, it isn't already obvious that we can be very creative when it comes to naming children. And by creative, I mean WHAT THE FUCK ARE YOU PEOPLE SMOKING?! WHO GAVE YOU PERMISSION TO BREED?! Now, there's a website completely dedicated to such creativity. Here're some examples:

Bon'Qui'Qui
Guuuuuurrrrrrllllll
V'Lanta'la'mana'ma'nisha
Grapedrankisha
Keyshawn
Shabalatabushalataquiba
Cornbreesha
D'Quell
Watermelonisha
Le-a (pronounced Le-dash-a)

I'm not even kidding with these. These are actual names. I HATE MY RACE!!! Honestly, must you be so black and promote just how much you loooove cornbread, fried chicken, and fucking grape drink to NAME YOUR KIDS AFTER THEM!? I think this explains why in a lot of inner-city schools, black kids have the most difficulty. Because when they were first learning to write and spell in kindergarten, the first thing they teach us is how to write our names. How are you expected to do well when you have a name that you can barely pronounce without a translator, let alone spell it? Honestly, the minute I read half the names on the website, I called my dad and thanked him for giving me a normal name like 'Lauren'. And people…don't claim that the reason you named your kid 'Tittyneisha' was because it means 'beloved' in Swahili.

The names was probably the breaking point, but I've had so many issues with black people that I might as well get them out now since I'm writing this (my midterm that was due a good four hours ago can wait). One thing is the idea of 'acting white'. Right, so because I know how to speak properly and don't start every conversation with: 'Yo! 'Sup son, dawg, my niggah, my homie G' followed by the most complex handshake combo ever, or listen to music that is simply some guy talking about the last joint he smoked, the last 12 chicks he fucked, how much bling he owns, and the last cop he

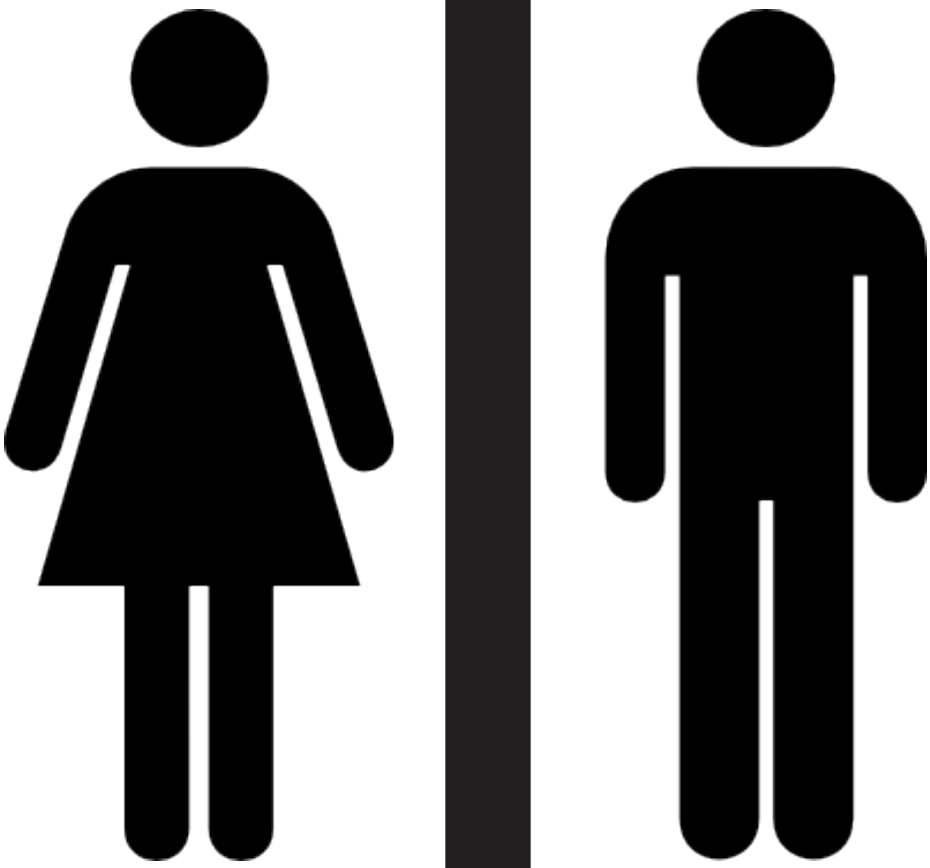
shot in "poetic" form means I'm "acting white". No. It means I have standards.

I feel I am completely justified in this rant. I am sick and tired of self-proclaimed "gangstas" giving the rest of us black people who go out and try and make something of our lives a bad name. If you agree with me, that's cool. If you think that I'm targeting you or someone you know with this rant, and become irrationally angry and decide to hunt me down, well…I don't give a shit. You can suck my 13 inch, non-existent dick.

Oh, and all you "wiggers" out there…I'm coming for you next.

SECTION LIES

CONSPICUOUSLY EMPTY --*ed.*



(please do not urinate on the Omen)